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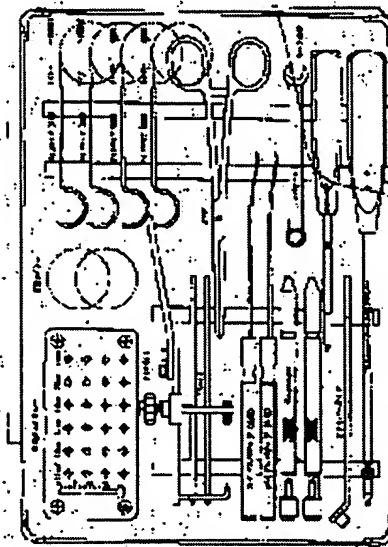
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## (54) OPERATION INSTRUMENT KIT FOR EXCISING OSTEOGENETIC VERTEBRAL ARCH

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide an operation instrument kit for excising an osteogenic vertebral arch having superior operability and safety as compared with the conventional one.

**SOLUTION:** This operation instrument kit for excising osteogenic vertebral arch enables laminectomy for vertebra and thoracic vertebra. As compared with the conventional laminectomy for the lumbar vertebra, the structure of a bone cutting wire is optimized, and this instrument is provided with right and left guide pipes, whereby a large improvement effect is obtained in respect of operability and safety as compared with the convention operation instrument kit for excising an osteogenic vertebral arch.




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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF  
DRAWINGS DRAWINGS

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CLAIMS

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[Claim(s)]

[Claim 1] The osteogenesis-laminectomy manual way machine which consists of an osteogenesis-laminectomy manual way machine for a cervical vertebra and thoracic vertebrae, and an osteogenesis-laminectomy manual way machine for lumbar vertebrae.

[Claim 2] The osteogenesis-laminectomy manual way machine for a cervical vertebra and thoracic vertebrae is an osteogenesis-laminectomy manual way machine according to claim 1 which consists of a bone end wire and a guide spatula.

[Claim 3] The osteogenesis-laminectomy manual way machine according to claim 1 or 2 characterized by preparing the serrate section for joint-capsule incision in one side of a guide spatula point.

[Claim 4] The osteogenesis-laminectomy manual way machine for lumbar vertebrae is an osteogenesis-laminectomy manual way machine according to claim 1 which consists of a bone end wire, a guide pipe, and a guide handle.

[Claim 5] The osteogenesis-laminectomy manual way machine according to claim 1 to 3 characterized by the bone end wire of the osteogenesis-laminectomy manual way machine for a cervical vertebra and thoracic vertebrae being a \*\*\*\* wire.

[Claim 6] The osteogenesis-laminectomy manual way machine according to claim 1 or 4 characterized by the bone end wire of the osteogenesis-laminectomy manual way machine for lumbar vertebrae being a spatula mold wire for outside approach, or a ball-shaped wire for inside approach.

[Claim 7] The osteogenesis-laminectomy manual way machine according to claim 1 to 6 characterized by an osteogenesis-laminectomy manual way machine consisting of an object for right-hand side, and an object for left-hand side.

[Claim 8] A package of an osteogenesis-laminectomy manual way machine characterized by including an osteogenesis-laminectomy manual way machine and a drill guide according to

claim 1 to 7.

[Claim 9] A package of an osteogenesis-laminectomy manual way machine which consists of an osteogenesis-laminectomy manual way machine according to claim 1 to 7, a drill guide, a drill, a bone screw, wire head grasping KANSHI, a driver guide, a bone screw driver, a universal hexagon-head driver, a spanner, and a receipt case.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the osteogenesis-laminectomy manual way machine of the spinal column used for a spinal surgery operation of a spinal cord tumor, spinal canal stenosis, etc.

[0002]

[Description of the Prior Art] It sets to a plastic surgery surgical operation, and is Leonard Gigli. Various amelioration is made after one steel wire which processed the front face into \*\* performs the bone end (Gigli, Centralblatt fur Chirurgie, 18, 409-411, 1894). Although these bone end wires are very convenient when performing cutting of the usual bone, its possibility of damaging a dura mater and the nerve root in the case of cutting of the bone near [, such as a spine, ] the nerve, i.e., a vertebral arch, is high.

[0003] Then, after letting a bone end wire pass to a VENYURA needle etc. and covering the cutting plane of a \*\*\*\* wire, the approach inserted in spine epidural apace etc. is common (1257 1249- the outside of Tomita et al. and \*\*\*\*, 28, and 1993). However, by the conventional approach, the operability at the time of inserting in spine epidural apace was bad, and since the skilled technique was required, there was a problem also in respect of safety.

[0004]

[Problem(s) to be Solved by the Invention] It is the purpose that this invention offers the new osteogenesis-laminectomy manual way machine which is excellent in respect of operability and safety compared with a Prior art.

[0005]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention persons repeat research wholeheartedly and came to develop the new osteogenesis-laminectomy manual way machine excellent in operability and safety.

[0006] First, in order to let a bone end wire pass to the bottom of an intervertebral foramen, i.e., a vertebral arch, how (direct approach) to let a wire pass to an intervertebral foramen directly and the approach (passing joint-of-the-vertebral-body-approach) of letting it pass to an intervertebral foramen via a joint of the vertebral body can be considered. The former is applied to lumbar vertebrae by the anatomical feature of the spinal column, and the latter is applied to a cervical vertebra and a thoracic vertebra. It is the new approach which the latter passes and joint-of-the-vertebral-body-approach does not have in the former, and is the high order in which a spine exists, i.e., the approach which enables cutting of a vertebral arch made difficult on a cervical vertebra and thoracic-vertebra level.

[0007] It passes for cutting of the vertebral arch of the cervical-vertebra section and the thoracic-vertebra section, and joint-of-the-vertebral-body-approach performs to it. Since the bone end wire set to the guide spatula reaches an intervertebral foramen through the inside of a joint of the

vertebral body, it can let a wire pass to an intervertebral foramen safely and easily. Therefore, in the point of a guide spatula, it has a hole for setting a bone end wire, and the serrate structure prepared in the side of tip one side in order to cut the joint capsule open. Consequently, it can set to the hole at the tip of a guide spatula through a wire, and a bone end wire can be guided to an intervertebral foramen safely and easily via the inside of a joint of the vertebral body from a vertebral-canal side.

[0008] Moreover, as for a wire point, it is desirable to carry out welding processing and to harden so that a bone end wire may tend to insert in the hole of a guide spatula the tip of a bone end wire used for the cervical-vertebra section and the thoracic-vertebra section.

[0009] Although direct approach performs vertebral arch cutting of a lumbar part, there are two kinds of approaches among these approaches. They are the approach (outside approach) of inserting into the vertebral canal from the outside of an intervertebral foramen, and the approach (inside approach) of inserting in an intervertebral-foramen outside from the inside of the vertebral canal. In case a bone end wire is inserted in an intervertebral foramen, it is important that the cutting plane of a bone end wire is not exposed because of insurance, it passes at this point, and differs from joint-of-the-vertebral-body-approach. Then, it is desirable by letting a bone end wire pass to a guide pipe to cover a cutting plane. Furthermore, in case the die length of a guide pipe inserts a bone end wire in spine epidural apace, its \*\*\*\*\* is desirable to extent to which the cutting plane of a bone end wire cannot contact the organization of the affected part circumference.

[0010] If exposed from the tip of a guide pipe, in case the tip of a bone end wire used for a lumbar part will insert a bone end wire in an intervertebral foramen, the danger of wounding dura mater etc. tissue especially in outside approach becomes high. Although the possibility of dura mater damage is low, in case a wire tip is buried into soft tissue and pinches and pulls out the point of a wire by wire head grasping KANSHI in \*\*\*\*\* inside approach, possibility of being hard coming to check a point is large.

[0011] Then, it is desirable to raise safety, while raising the operability at the time of inserting a bone end wire in an intervertebral foramen by improving the structure at the tip of a bone end wire. As a result of paying one's attention to this invention persons by the cervical vertebra, the thoracic vertebra, and lumbar vertebrae of a spine that the configuration and magnitude of space of the gestalt of a joint of the vertebral body or spine epidural apace differ from each other, the tip structures of a bone end wire are a cervical vertebra, an object for a thoracic-vertebra operation, and an object for a lumbar-vertebrae operation, and reached the conclusion that optimizing, respectively was desirable. Such tip structures serve also as a stopper with which the bone end wire which it let pass to the guide pipe prevents falling out from a guide pipe in the object for lumbar vertebrae. Moreover, in a cervical vertebra and the object for thoracic vertebrae, it is desirable to carry out welding processing and to harden a point so that a bone end wire may be easy through to the hole of a guide spatula.

[0012] Moreover, when the back end of a lumbar-vertebrae bone end wire is exposed from the back end of a guide pipe, there is a possibility of wounding a way person at the time of an operation. Therefore, it is desirable that it is the structure which can contain the bone end wire exposed from the back end of a guide pipe by making a core into hollow structure while the guide handle for raising the operability at the time of inserting a bone end wire in an intervertebral foramen is structure convenient for a way person to hold.

[0013]

[Embodiment of the Invention] The gestalt of implementation of invention is explained with

reference to a drawing based on an example.

[0014] The wire material for bone end wires is stainless steel so that it may have the reinforcement of extent which can cut the spinal column and may have the surface roughness of extent which is not slippery on a bone front face at the time of cutting. It is made the shape of twisted yarn which made the filament made from steel gather. Although there is especially no limit about an outer diameter, 0.5mm or less is suitable.

[0015] A guide spatula is a spatula for a guide used in order to let a bone end wire pass to the intervertebral foramen of a cervical vertebra and a thoracic vertebra. In order are [ the inside of a joint of the vertebral body ] through-easy and to carry out it as a guide of a bone end wire, the point of a guide spatula is sheet metal-like, and it is desirable to have carried out bending to the shape of a loose curve. Moreover, to the point of a guide spatula, the hole for letting a bone end wire pass is produced. In case it fixes to two holes of a point through a bone end wire and lets the inside of a joint of the vertebral body pass, it is made to have been hard for the wire to escape at the time of use. Between two holes of a guide spatula point, one slot is produced along the die-length direction of a guide spatula at the rear face of a point. This is a device for passing through the inside of narrow space smoothly by abolishing the slack of the set \*\*\*\* wire and changing into the condition that the rear face and wire of a spatula stuck. Moreover, in order to cut the joint capsule open, serrate structure is prepared in the single-sided side of a point, and it can use as a saw. Moreover, in the object for right-hand side, and the object for left-hand side, the serrate structure of the point side is prepared in the opposite side, respectively. When it lets a wire pass to two holes at the tip of a guide spatula and is made to go via the inside of a narrow joint of the vertebral body from a vertebral-canal side to an intervertebral foramen as a result of these devices, a bone end wire can be guided with safely sufficient operability. An example of a guide spatula was shown in drawing 1 .

[0016] Even if it is buried in the soft tissue of an intervertebral-foramen outside in outside approach about the tip metallic ornaments of the bone end wire for lumbar vertebrae (for direct approach) of this invention, it is desirable that it is a spatula mold as a configuration which the tip tends to check, and what performed bending according to the configuration of a guide pipe further is the optimal. Moreover, when it lets a bone end wire pass to a guide pipe, in order not to draw a point in a guide pipe, the maximum width of tip metallic ornaments needs to be larger than the outer diameter of a guide pipe. An example which carried out caulking processing of the tip metallic ornaments of a spatula mold was shown at the tip of the cable made from SUS304 stainless steel with an outer diameter of 0.36mm at drawing 2 .

[0017] About the tip metallic ornaments of a bone end wire used for inside approach, spherical structure is the optimal in consideration of the configuration of the spine epidural apace of lumbar vertebrae in the inside for lumbar vertebrae (for direct approach). Moreover, when it lets a bone end wire pass to a guide pipe, in order not to draw a point in a guide pipe, the overall diameter of tip metallic ornaments needs to be larger than the outer diameter of a guide pipe. However, since there is a possibility of pressing a surrounding organization, at the time of insertion to the spine epidural apace of lumbar vertebrae when too not much large, the overall diameter of ball-shaped tip metallic ornaments is restricted naturally. An example which carried out caulking processing of the ball type tip metallic ornaments was shown at the tip of the cable made from SUS304 stainless steel with an outer diameter of 0.36mm at drawing 3 .

[0018] In case a guide pipe inserts a bone end wire in a lumbar-vertebrae intervertebral foramen, it is the first purpose by covering the cutting front face of a bone end wire to prevent damage on a circumference organization. Therefore, a \*\*\*\*\* is more nearly required for the die length

of a guide pipe than the die length of the part which contacts a circumference organization at the time of insertion. Moreover, a guide pipe must be what can secure the bore of extent which can take out and insert a bone end wire smoothly, when letting a bone end wire pass to a guide pipe, and when sampling a guide pipe after intervertebral-foramen insertion. Moreover, in order to make the configuration of an intervertebral foramen suit, the shape not of a straight line but the configuration which is easy to suit the configuration of an intervertebral foramen of the proximal region of a guide pipe, for example, a circular thing, is desirable. Moreover, the outer diameter of a guide pipe needs a small thing for extent which can let a lumbar-vertebrae intervertebral foramen pass smoothly. Furthermore, in order to prevent the damage done at the time of contact in an organization, as for the outside surface of a guide pipe, it is desirable to change into a smooth condition according to mirror plane finishing etc.

[0019] Moreover, there are two cases, the case where a bone end wire is inserted in a right-hand side intervertebral foramen, and when carrying out to a left-hand side intervertebral foramen, at least by the surgical operating suite. In order to correspond to such a situation, there are no circular part and straight-line part at a tip of a guide pipe in the same flat surface, and it is necessary to have the suitable include angle. When producing such a guide pipe, after processing the circular part at the tip of a guide pipe, it can produce by whether a straight-line-like part is bent on the right-hand side of a circular part, or it bends on left-hand side. It is good for especially a limit not to have an angle of bend at this time, and to consider as the optimal include angle according to an application.

[0020] The product made from SUS304 showed an example of the guide pipe for left-hand side using a pipe (an outside surface is mirror plane finishing) with an outer diameter [ of 2.0mm ], and a bore of 1.0mm to drawing 4 . In addition, in this example, the include angle of the circular part at a tip and a straight-line-like part is made into 45 degrees. In consideration of safety, press working of sheet metal of about 3mm of the tips of a guide pipe is carried out, and eye Kakumaru of a point is given.

[0021] If the handle sections 4 of a guide handle ( drawing 5 ) are a suitable size for a way person to grasp and die length, especially a limit will not have them. In order to insert a bone end wire in the core of a guide handle, hollow structure is established in the die-length direction (the broken line has shown to drawing 5). The path of this centrum will not be especially restricted, if it is the size of extent which can insert a bone end wire smoothly. The tip electrode holder 6 and the tip metallic ornaments 3 for fixing a guide pipe are formed in the point. There are the lock block 7 and a clamping cap 5 in the back end section, and it uses for the lock of a bone end wire. A pin 8 and a pin 9 move the lock block 7, and in case the \*\*\*\* wire which the centrum let pass is fixed, they are used.

[0022] An osteogenesis-laminectomy manual way machine consists of a \*\*\*\* wire, a guide pipe, and a guide handle as a \*\*\*\* wire, a guide spatula, and an object for lumbar vertebrae as a cervical vertebra and an object for thoracic vertebrae. Moreover, at the time of the operation of the cervical-vertebra section and the thoracic-vertebra section, it lets a \*\*\*\* wire pass to two holes of a guide spatula. At the time of the operation of a \*\*\*\*\* lumbar part, the back end section of a \*\*\*\* wire is inserted from the point of a guide pipe, a \*\*\*\* wire is pulled out from the back end section of a guide pipe, and the tip metallic ornaments of a \*\*\*\* wire are correctly set to the point of a guide pipe. Especially when the \*\*\* wire of a tip spatula mold is set, it is required to check that the sense of tip metallic ornaments is right. Next, from opening at the tip of a guide handle, the back end section of a \*\*\*\* wire is inserted in a centrum, and a \*\*\*\* wire is pulled out from the back end section of a guide handle. If a lock block (7 of drawing 5 ) is

back lengthened after checking that a bone end wire is pulled and there is no sag after inserting the back end section of a guide handle in tip opening of a guide handle and fixing to it, a bone end wire is fixed and it will be in an usable condition.

[0023] In the osteogenesis laminectomy operation of the cervical-vertebra section and the thoracic-vertebra section, the osteogenesis-laminectomy manual way machine which set the \*\*\*\* wire to the guide spatula is used. In the osteogenesis laminectomy operation of a lumbar part, the osteogenesis-laminectomy manual way machine by which the tip set the wire of a ball type or a spatula mold according to the application is used.

[0024] Moreover, in the case of a right-hand side vertebral arch, in the case of a left-hand side vertebral arch, the osteogenesis-laminectomy manual way machine for left-hand side is used for the osteogenesis-laminectomy manual way machine for right-hand side by right and left of the vertebral arch to cut.

[0025] An efficient operation is possible if a package required for the osteogenesis-laminectomy operation of a bone screw, a drill guide, a drill, wire head grasping KANSHI, a driver guide, a bone screw driver, etc. of instruments is arranged in the receipt case in addition to these osteogenesis-laminectomy manual way machines. Although there will be especially no limit if a receipt case is the material which can be equal to autoclave sterilization, from a viewpoint of lightweight-izing, the receipt case made from aluminum is the optimal. Although there will be especially no limit if it is the material which is installed in a receipt case and with which the member for fixing the location of each instrument can also be equal to autoclave sterilization, the product made of silicone rubber is the optimal.

[0026] A drill stab hole is firmly fixed to a vertebral arch by the drill guide tip in a serrate configuration so that the point reaching [ punching ] can be correctly directed now and a punching point may be stabilized, so that, as for a drill guide, a drill can punch the inside of a very thin vertebral arch correctly ( drawing 6 R> 6 ).

[0027] In the operation which needs the actuation in the vertebral canal of a spinal cord tumor, spinal canal stenosis, etc., the osteogenesis-laminectomy manual way machine of this invention and a package of an osteogenesis-laminectomy manual way machine are useful in a spinal surgery operation.

[0028] Using the osteogenesis-laminectomy manual way machine of this invention, by the lumbar part, the radii section of a guide pipe is inserted in a patient's intervertebral foramen, and the tip metallic ornaments of a bone end wire are exposed to the opposite side. After canceling the lock block of the guide handle back end and taking out tip metallic ornaments to a suitable location, the radii section of the inserted guide pipe is extracted besides spine epidural space, and, finally it leaves only a bone end wire to an intervertebral foramen.

[0029] In the cervical-vertebra section and the thoracic-vertebra section, the guide spatula which let the \*\*\*\* wire pass is inserted so that the joint capsule of the joint-of-the-vertebral-body inside may be detached from the inside of the vertebral canal, the joint capsule of a joint-of-the-vertebral-body outside is separated via a joint-of-the-vertebral-body cavity, after taking out a guide spatula to the outside of an intervertebral foramen, a guide spatula is extracted to a patient's intervertebral foramen, and finally it leaves only a bone end wire to it at an intervertebral foramen.

[0030] After having the suitable part of the both sides of the inserted bone end wire by the hand on either side and doubling at least with the bony cutting section, a bone end wire is pulled alternately with right and left, and is cut. It becomes possible to undergo an operation by this approach by cutting the required part of the vertebral arch of a spine and developing the affected

part in the vertebral canal, without damaging a dura mater and the nerve root.

[0031] The bone screw contained in a package of an osteogenesis-laminectomy manual way machine, a drill guide, a drill, wire head grasping KANSHI, a driver guide, and a bone screw driver are used, in case the spicule after cutting is returned to the original location and it fixes. As for a drill guide, the outlet section is made into the shape of a hook, and it is caught in the hole of the outlet section, and the stab section is serrate and can hold a bone now firmly so that the drilling of the inside of the spicule of a thin vertebral arch can be carried out correctly, and the stab section and the outlet section of drilling may be grasped exactly. A screw hole is made in order to let the bone screw for fixing the cut spicule to the original location using this drill guide pass. Although a bone screw can use a commercial item, the cortical bone screw (medical-supply acknowledgement number: 20100BZZ01423000) of Nakasima Propeller has the advantage that a spicule is fixable with a bone screw driver, for example, without doing the activity which cuts a tap beforehand, since the tap is cut to the point of the screw made from titanium.

[0032]

[Example] Although the example of an operation which used the osteogenesis-laminectomy manual way machine of this invention is shown as an example in order to show the usefulness of the osteogenesis-laminectomy manual way machine of this invention below, this invention is not limited only to these examples.

[0033]

[Example 1] It passed in vertebral arch cutting of the patient of the spinal cord tumor of the cervical-vertebra section, and joint-of-the-vertebral-body-approach was used for it. In two holes of the point of the guide spatula for right-hand side After setting through a \*\*\*\* wire, the guide spatula was inserted from the vertebral-canal side of a patient's cervical vertebra. It inserted so that the joint capsule of the joint-of-the-vertebral-body inside might be detached from the inside of the vertebral canal, and the guide spatula was extracted, after separating the joint capsule of a joint-of-the-vertebral-body outside via the joint-of-the-vertebral-body cavity and taking out a guide spatula to the outside of an intervertebral foramen. Finally it left only the bone end wire to the intervertebral foramen, and the right-hand side vertebral arch was cut with the wire. By this approach, the vertebral arch was able to be cut safely, without injuring a surrounding organization. Similarly, by cutting a left-hand side vertebral arch using the guide spatula for left-hand side, laminectomy could be performed, the dura mater in the vertebral canal could fully be developed, and it became possible to undergo an operation for a neoplasm.

[0034]

[Example 2] In the inside approach of lumbar vertebrae, after setting a spatula mold wire to a guide pipe and a guide handle, the point of a guide pipe was inserted in the outside of an intervertebral foramen from the inside of the vertebral canal. The spatula mold section of a wire was pinched by wire head grasping KANSHI, and the wire was pulled out to suitable die length. Next, after removing the guide pipe and the guide handle and changing into the condition of only a wire, the target vertebral arch was cut with the wire.

[0035]

[Example 3] In the outside approach of lumbar vertebrae, after setting a ball-shaped wire to a guide pipe and a guide handle, the point of a guide pipe was inserted into the vertebral canal from the outside of an intervertebral foramen. The ball-shaped section of a wire was pinched by wire head grasping KANSHI, and the wire was pulled out to suitable die length. Next, after removing the guide pipe and the guide handle and changing into the condition of only a wire, the target vertebral arch was cut with the wire.

[0036]

[Effect of the Invention] The osteogenesis-laminectomy manual way machine of this invention made possible osteogenesis-laminectomy which was not conventionally completed in the cervical-vertebra section and the thoracic-vertebra section. The structure of the bone end wire for osteogenesis-laminectomy in a lumbar part was optimized in outside approach and inside approach, respectively. And it is characterized by having the guide pipe the object for right-hand side, and for left-hand side, and a big improvement effect is acquired in respect of operability and safety as compared with the conventional osteogenesis-laminectomy manual way machine. Moreover, it is not necessary to put an expensive and mighty spine instrument into the inside of the body, and big effectiveness is acquired also in respect of health care cost mitigation also by the therapeutic aspect by holding this technique.

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## TECHNICAL FIELD

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[Field of the Invention] This invention relates to the osteogenesis-laminectomy manual way machine of the spinal column used for a spinal surgery operation of a spinal cord tumor, spinal canal stenosis, etc.

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## PRIOR ART

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[Description of the Prior Art] It sets to a plastic surgery surgical operation, and is Leonard Gigli. Various amelioration is made after one steel wire which processed the front face into \*\* performs the bone end (Gigli, Centralblatt fur Chirurgie, 18, 409-411, 1894). Although these bone end wires are very convenient when performing cutting of the usual bone, its possibility of damaging a dura mater and the nerve root in the case of cutting of the bone near [, such as a spine, ] the nerve, i.e., a vertebral arch, is high.

[0003] Then, after letting a bone end wire pass to a VENYURA needle etc. and covering the cutting plane of a \*\*\*\* wire, the approach inserted in spine epidural apace etc. is common (1257 1249- the outside of Tomita et al. and \*\*\*\*, 28, and 1993). However, by the conventional approach, the operability at the time of inserting in spine epidural apace was bad, and since the skilled technique was required, there was a problem also in respect of safety.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] The osteogenesis-laminectomy manual way machine of this invention made possible osteogenesis-laminectomy which was not conventionally completed in the cervical-vertebra section and the thoracic-vertebra section. The structure of the bone end wire for osteogenesis-laminectomy in a lumbar part was optimized in outside approach and inside approach, respectively. And it is characterized by having the guide pipe the object for right-hand side, and for left-hand side, and a big improvement effect is acquired in respect of operability and safety as compared with the conventional osteogenesis-laminectomy manual way machine. Moreover, it is not necessary to put an expensive and mighty spine instrument into the inside of

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] It is the purpose that this invention offers the new osteogenesis-laminectomy manual way machine which is excellent in respect of operability and safety compared with a Prior art.

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## MEANS

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[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention persons repeat research wholeheartedly and came to develop the new osteogenesis-laminectomy manual way machine excellent in operability and safety.

[0006] First, in order to let a bone end wire pass to the bottom of an intervertebral foramen, i.e., a vertebral arch, how (direct approach) to let a wire pass to an intervertebral foramen directly and the approach (passing joint-of-the-vertebral-body-approach) of letting it pass to an intervertebral foramen via a joint of the vertebral body can be considered. The former is applied to lumbar vertebrae by the anatomical feature of the spinal column, and the latter is applied to a cervical vertebra and a thoracic vertebra. It is the new approach which the latter passes and joint-of-the-vertebral-body-approach does not have in the former, and is the high order in which a spine exists, i.e., the approach which enables cutting of a vertebral arch made difficult on a cervical vertebra and thoracic-vertebra level.

[0007] It passes for cutting of the vertebral arch of the cervical-vertebra section and the thoracic-vertebra section, and joint-of-the-vertebral-body-approach performs to it. Since the bone end wire set to the guide spatula reaches an intervertebral foramen through the inside of a joint of the vertebral body, it can let a wire pass to an intervertebral foramen safely and easily. Therefore, in the point of a guide spatula, it has a hole for setting a bone end wire, and the serrate structure prepared in the side of tip one side in order to cut the joint capsule open. Consequently, it can set to the hole at the tip of a guide spatula through a wire, and a bone end wire can be guided to an intervertebral foramen safely and easily via the inside of a joint of the vertebral body from a vertebral-canal side.

[0008] Moreover, as for a wire point, it is desirable to carry out welding processing and to harden so that a bone end wire may tend to insert in the hole of a guide spatula the tip of a bone end wire used for the cervical-vertebra section and the thoracic-vertebra section.

[0009] Although direct approach performs vertebral arch cutting of a lumbar part, there are two kinds of approaches among these approaches. They are the approach (outside approach) of inserting into the vertebral canal from the outside of an intervertebral foramen, and the approach (inside approach) of inserting in an intervertebral-foramen outside from the inside of the vertebral canal. In case a bone end wire is inserted in an intervertebral foramen, it is important that the cutting plane of a bone end wire is not exposed because of insurance, it passes at this point, and differs from joint-of-the-vertebral-body-approach. Then, it is desirable by letting a bone end wire pass to a guide pipe to cover a cutting plane. Furthermore, in case the die length of a guide pipe

inserts a bone end wire in spine epidural apace, its \*\*\*\*\* is desirable to extent to which the cutting plane of a bone end wire cannot contact the organization of the affected part circumference.

[0010] If exposed from the tip of a guide pipe, in case the tip of a bone end wire used for a lumbar part will insert a bone end wire in an intervertebral foramen, the danger of wounding dura mater etc. tissue especially in outside approach becomes high. Although the possibility of dura mater damage is low, in case a wire tip is buried into soft tissue and pinches and pulls out the point of a wire by wire head grasping KANSHI in \*\*\*\*\* inside approach, possibility of being hard coming to check a point is large.

[0011] Then, it is desirable to raise safety, while raising the operability at the time of inserting a bone end wire in an intervertebral foramen by improving the structure at the tip of a bone end wire. As a result of paying one's attention to this invention persons by the cervical vertebra, the thoracic vertebra, and lumbar vertebrae of a spine that the configuration and magnitude of space of the gestalt of a joint of the vertebral body or spine epidural apace differ from each other, the tip structures of a bone end wire are a cervical vertebra, an object for a thoracic-vertebra operation, and an object for a lumbar-vertebrae operation, and reached the conclusion that optimizing, respectively was desirable. Such tip structures serve also as a stopper with which the bone end wire which it let pass to the guide pipe prevents falling out from a guide pipe in the object for lumbar vertebrae. Moreover, in a cervical vertebra and the object for thoracic vertebrae, it is desirable to carry out welding processing and to harden a point so that a bone end wire may be easy through to the hole of a guide spatula.

[0012] Moreover, when the back end of a lumbar-vertebrae bone end wire is exposed from the back end of a guide pipe, there is a possibility of wounding a way person at the time of an operation. Therefore, it is desirable that it is the structure which can contain the bone end wire exposed from the back end of a guide pipe by making a core into hollow structure while the guide handle for raising the operability at the time of inserting a bone end wire in an intervertebral foramen is structure convenient for a way person to hold.

[0013]

[Embodiment of the Invention] The gestalt of implementation of invention is explained with reference to a drawing based on an example.

[0014] The wire material for bone end wires is stainless steel so that it may have the reinforcement of extent which can cut the spinal column and may have the surface roughness of extent which is not slippery on a bone front face at the time of cutting. It is made the shape of twisted yarn which made the filament made from steel gather. Although there is especially no limit about an outer diameter, 0.5mm or less is suitable.

[0015] A guide spatula is a spatula for a guide used in order to let a bone end wire pass to the intervertebral foramen of a cervical vertebra and a thoracic vertebra. In order are [ the inside of a joint of the vertebral body ] through-easy and to carry out it as a guide of a bone end wire, the point of a guide spatula is sheet metal-like, and it is desirable to have carried out bending to the shape of a loose curve. Moreover, to the point of a guide spatula, the hole for letting a bone end wire pass is produced. In case it fixes to two holes of a point through a bone end wire and lets the inside of a joint of the vertebral body pass, it is made to have been hard for the wire to escape at the time of use. Between two holes of a guide spatula point, one slot is produced along the die-length direction of a guide spatula at the rear face of a point. This is a device for passing through the inside of narrow space smoothly by abolishing the slack of the set \*\*\*\* wire and changing into the condition that the rear face and wire of a spatula stuck. Moreover, in order to cut the

joint capsule open, serrate structure is prepared in the single-sided side of a point, and it can use as a saw. Moreover, in the object for right-hand side, and the object for left-hand side, the serrate structure of the point side is prepared in the opposite side, respectively. When it lets a wire pass to two holes at the tip of a guide spatula and is made to go via the inside of a narrow joint of the vertebral body from a vertebral-canal side to an intervertebral foramen as a result of these devices, a bone end wire can be guided with safely sufficient operability. An example of a guide spatula was shown in drawing 1.

[0016] Even if it is buried in the soft tissue of an intervertebral-foramen outside in outside approach about the tip metallic ornaments of the bone end wire for lumbar vertebrae (for direct approach) of this invention, it is desirable that it is a spatula mold as a configuration which the tip tends to check, and what performed bending according to the configuration of a guide pipe further is the optimal. Moreover, when it lets a bone end wire pass to a guide pipe, in order not to draw a point in a guide pipe, the maximum width of tip metallic ornaments needs to be larger than the outer diameter of a guide pipe. An example which carried out caulking processing of the tip metallic ornaments of a spatula mold was shown at the tip of the cable made from SUS304 stainless steel with an outer diameter of 0.36mm at drawing 2.

[0017] About the tip metallic ornaments of a bone end wire used for inside approach, spherical structure is the optimal in consideration of the configuration of the spine epidural apace of lumbar vertebrae in the inside for lumbar vertebrae (for direct approach). Moreover, when it lets a bone end wire pass to a guide pipe, in order not to draw a point in a guide pipe, the overall diameter of tip metallic ornaments needs to be larger than the outer diameter of a guide pipe. However, since there is a possibility of pressing a surrounding organization, at the time of insertion to the spine epidural apace of lumbar vertebrae when too not much large, the overall diameter of ball-shaped tip metallic ornaments is restricted naturally. An example which carried out caulking processing of the ball type tip metallic ornaments was shown at the tip of the cable made from SUS304 stainless steel with an outer diameter of 0.36mm at drawing 3.

[0018] In case a guide pipe inserts a bone end wire in a lumbar-vertebrae intervertebral foramen, it is the first purpose by covering the cutting front face of a bone end wire to prevent damage on a circumference organization. Therefore, a \*\*\*\*\* is more nearly required for the die length of a guide pipe than the die length of the part which contacts a circumference organization at the time of insertion. Moreover, a guide pipe must be what can secure the bore of extent which can take out and insert a bone end wire smoothly, when letting a bone end wire pass to a guide pipe, and when sampling a guide pipe after intervertebral-foramen insertion. Moreover, in order to make the configuration of an intervertebral foramen suit, the shape not of a straight line but the configuration which is easy to suit the configuration of an intervertebral foramen of the proximal region of a guide pipe, for example, a circular thing, is desirable. Moreover, the outer diameter of a guide pipe needs a small thing for extent which can let a lumbar-vertebrae intervertebral foramen pass smoothly. Furthermore, in order to prevent the damage done at the time of contact in an organization, as for the outside surface of a guide pipe, it is desirable to change into a smooth condition according to mirror plane finishing etc.

[0019] Moreover, there are two cases, the case where a bone end wire is inserted in a right-hand side intervertebral foramen, and when carrying out to a left-hand side intervertebral foramen, at least by the surgical operating suite. In order to correspond to such a situation, there are no circular part and straight-line part at a tip of a guide pipe in the same flat surface, and it is necessary to have the suitable include angle. When producing such a guide pipe, after processing the circular part at the tip of a guide pipe, it can produce by whether a straight-line-like part is

bent on the right-hand side of a circular part, or it bends on left-hand side. It is good for especially a limit not to have an angle of bend at this time, and to consider as the optimal include angle according to an application.

[0020] The product made from SUS304 showed an example of the guide pipe for left-hand side using a pipe (an outside surface is mirror plane finishing) with an outer diameter [ of 2.0mm ], and a bore of 1.0mm to drawing 4 . In addition, in this example, the include angle of the circular part at a tip and a straight-line-like part is made into 45 degrees. In consideration of safety, press working of sheet metal of about 3mm of the tips of a guide pipe is carried out, and eye Kakumaru of a point is given.

[0021] If the handle sections 4 of a guide handle ( drawing 5 ) are a suitable size for a way person to grasp and die length, especially a limit will not have them. In order to insert a bone end wire in the core of a guide handle, hollow structure is established in the die-length direction (the broken line has shown to drawing 5 ). The path of this centrum will not be especially restricted, if it is the size of extent which can insert a bone end wire smoothly. The tip electrode holder 6 and the tip metallic ornaments 3 for fixing a guide pipe are formed in the point. There are the lock block 7 and a clamping cap 5 in the back end section, and it uses for the lock of a bone end wire. A pin 8 and a pin 9 move the lock block 7, and in case the \*\*\*\* wire which the centrum let pass is fixed, they are used.

[0022] An osteogenesis-laminectomy manual way machine consists of a \*\*\*\* wire, a guide pipe, and a guide handle as a \*\*\*\* wire, a guide spatula, and an object for lumbar vertebrae as a cervical vertebra and an object for thoracic vertebrae. Moreover, at the time of the operation of the cervical-vertebra section and the thoracic-vertebra section, it lets a \*\*\*\* wire pass to two holes of a guide spatula. At the time of the operation of a \*\*\*\*\* lumbar part, the back end section of a \*\*\*\* wire is inserted from the point of a guide pipe, a \*\*\*\* wire is pulled out from the back end section of a guide pipe, and the tip metallic ornaments of a \*\*\*\* wire are correctly set to the point of a guide pipe. Especially when the \*\*\*\* wire of a tip spatula mold is set, it is required to check that the sense of tip metallic ornaments is right. Next, from opening at the tip of a guide handle, the back end section of a \*\*\*\* wire is inserted in a centrum, and a \*\*\*\* wire is pulled out from the back end section of a guide handle. If a lock block (7 of drawing 5 ) is back lengthened after checking that a bone end wire is pulled and there is no sag after inserting the back end section of a guide handle in tip opening of a guide handle and fixing to it, a bone end wire is fixed and it will be in an usable condition.

[0023] In the osteogenesis laminectomy operation of the cervical-vertebra section and the thoracic-vertebra section, the osteogenesis-laminectomy manual way machine which set the \*\*\*\* wire to the guide spatula is used. In the osteogenesis laminectomy operation of a lumbar part, the osteogenesis-laminectomy manual way machine by which the tip set the wire of a ball type or a spatula mold according to the application is used.

[0024] Moreover, in the case of a right-hand side vertebral arch, in the case of a left-hand side vertebral arch, the osteogenesis-laminectomy manual way machine for left-hand side is used for the osteogenesis-laminectomy manual way machine for right-hand side by right and left of the vertebral arch to cut.

[0025] An efficient operation is possible if a package required for the osteogenesis-laminectomy operation of a bone screw, a drill guide, a drill, wire head grasping KANSHI, a driver guide, a bone screw driver, etc. of instruments is arranged in the receipt case in addition to these osteogenesis-laminectomy manual way machines. Although there will be especially no limit if a receipt case is the material which can be equal to autoclave sterilization, from a viewpoint of

lightweight-izing, the receipt case made from aluminum is the optimal. Although there will be especially no limit if it is the material which is installed in a receipt case and with which the member for fixing the location of each instrument can also be equal to autoclave sterilization, the product made of silicone rubber is the optimal.

[0026] A drill stab hole is firmly fixed to a vertebral arch by the drill guide tip in a serrate configuration so that the point reaching [ punching ] can be correctly directed now and a punching point may be stabilized, so that, as for a drill guide, a drill can punch the inside of a very thin vertebral arch correctly (drawing 6 R>6).

[0027] In the operation which needs the actuation in the vertebral canal of a spinal cord tumor, spinal canal stenosis, etc., the osteogenesis-laminectomy manual way machine of this invention and a package of an osteogenesis-laminectomy manual way machine are useful in a spinal surgery operation.

[0028] Using the osteogenesis-laminectomy manual way machine of this invention, by the lumbar part, the radii section of a guide pipe is inserted in a patient's intervertebral foramen, and the tip metallic ornaments of a bone end wire are exposed to the opposite side. After canceling the lock block of the guide handle back end and taking out tip metallic ornaments to a suitable location, the radii section of the inserted guide pipe is extracted besides spine epidural space, and, finally it leaves only a bone end wire to an intervertebral foramen.

[0029] In the cervical-vertebra section and the thoracic-vertebra section, the guide spatula which let the \*\*\*\* wire pass is inserted so that the joint capsule of the joint-of-the-vertebral-body inside may be detached from the inside of the vertebral canal, the joint capsule of a joint-of-the-vertebral-body outside is separated via a joint-of-the-vertebral-body cavity, after taking out a guide spatula to the outside of an intervertebral foramen, a guide spatula is extracted to a patient's intervertebral foramen, and finally it leaves only a bone end wire to it at an intervertebral foramen.

[0030] After having the suitable part of the both sides of the inserted bone end wire by the hand on either side and doubling at least with the bony cutting section, a bone end wire is pulled alternately with right and left, and is cut. It becomes possible to undergo an operation by this approach by cutting the required part of the vertebral arch of a spine and developing the affected part in the vertebral canal, without damaging a dura mater and the nerve root.

[0031] The bone screw contained in a package of an osteogenesis-laminectomy manual way machine, a drill guide, a drill, wire head grasping KANSHI, a driver guide, and a bone screw driver are used, in case the spicule after cutting is returned to the original location and it fixes. As for a drill guide, the outlet section is made into the shape of a hook, and it is caught in the hole of the outlet section, and the stab section is serrate and can hold a bone now firmly so that the drilling of the inside of the spicule of a thin vertebral arch can be carried out correctly, and the stab section and the outlet section of drilling may be grasped exactly. A screw hole is made in order to let the bone screw for fixing the cut spicule to the original location using this drill guide pass. Although a bone screw can use a commercial item, the cortical bone screw (medical-supply acknowledgement number: 20100BZZ01423000) of Nakasima Propeller has the advantage that a spicule is fixable with a bone screw driver, for example, without doing the activity which cuts a tap beforehand, since the tap is cut to the point of the screw made from titanium.

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## EXAMPLE

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[Example] Although the example of an operation which used the osteogenesis-laminectomy manual way machine of this invention is shown as an example in order to show the usefulness of the osteogenesis-laminectomy manual way machine of this invention below, this invention is not limited only to these examples.

[0033]

[Example 1] It passed in vertebral arch cutting of the patient of the spinal cord tumor of the cervical-vertebra section, and joint-of-the-vertebral-body-approach was used for it. In two holes of the point of the guide spatula for right-hand side After setting through a \*\*\*\* wire, the guide spatula was inserted from the vertebral-canal side of a patient's cervical vertebra. It inserted so that the joint capsule of the joint-of-the-vertebral-body inside might be detached from the inside of the vertebral canal, and the guide spatula was extracted, after separating the joint capsule of a joint-of-the-vertebral-body outside via the joint-of-the-vertebral-body cavity and taking out a guide spatula to the outside of an intervertebral foramen. Finally it left only the bone end wire to the intervertebral foramen, and the right-hand side vertebral arch was cut with the wire. By this approach, the vertebral arch was able to be cut safely, without injuring a surrounding organization. Similarly, by cutting a left-hand side vertebral arch using the guide spatula for left-hand side, laminectomy could be performed, the dura mater in the vertebral canal could fully be developed, and it became possible to undergo an operation for a neoplasm.

[0034]

[Example 2] In the inside approach of lumbar vertebrae, after setting a spatula mold wire to a guide pipe and a guide handle, the point of a guide pipe was inserted in the outside of an intervertebral foramen from the inside of the vertebral canal. The spatula mold section of a wire was pinched by wire head grasping KANSHI, and the wire was pulled out to suitable die length. Next, after removing the guide pipe and the guide handle and changing into the condition of only a wire, the target vertebral arch was cut with the wire.

[0035]

[Example 3] In the outside approach of lumbar vertebrae, after setting a ball-shaped wire to a guide pipe and a guide handle, the point of a guide pipe was inserted into the vertebral canal from the outside of an intervertebral foramen. The ball-shaped section of a wire was pinched by wire head grasping KANSHI, and the wire was pulled out to suitable die length. Next, after removing the guide pipe and the guide handle and changing into the condition of only a wire, the target vertebral arch was cut with the wire.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the structure of a guide spatula, and right-hand side is a front view and left-hand side is the 2nd page Fig. of a side elevation.

[Drawing 2] It is drawing showing the substructure of the point of a spatula mold wire, and the bottom is a front view and the bottom is the 2nd page Fig. of a side elevation.

[Drawing 3] It is drawing showing the substructure of the point of a ball-shaped wire, and the

bottom is a front view and the bottom is the 2nd page Fig. of a side elevation.

[Drawing 4] It is drawing showing the structure of the guide pipe for left-hand side, and the bottom is a side elevation and the bottom is the 2nd page Fig. of a front view.

[Drawing 5] It is drawing showing the structure of a guide handle.

[Drawing 6] It is drawing showing the structure of a drill guide, and right-hand side is a front view and left-hand side is the 2nd page Fig. of a side elevation.

[Drawing 7] It is drawing showing a package of an osteogenesis-laminectomy manual way machine.

[Description of Notations]

- 1 -- Hole for letting a \*\*\*\* wire pass
- 2 -- The serrate section for joint-capsule incision
- 3 -- Tip metallic ornaments
- 4 -- Handle
- 5 -- Clamping cap
- 6 -- Tip electrode holder
- 7 -- Lock block
- 8 -- Pin 1
- 9 -- Pin 2

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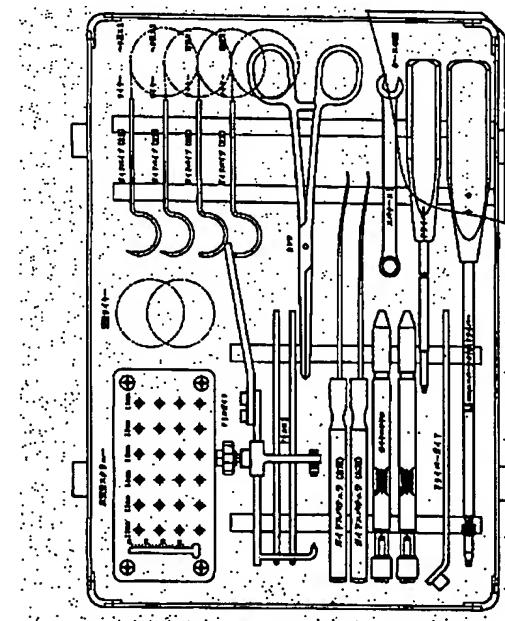
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(54)【発明の名称】 骨形成的椎弓切除術用手術器械

(57)【要約】

【課題】 本発明は、従来の技術にくらべて、操作性および安全性の点で優れている新規な骨形成的椎弓切除術用手術器械を提供することを目的とする。

【解決手段】 本発明の骨形成的椎弓切除術用手術器械は、頸椎、胸椎の椎弓切除を可能とした。また従来より行われている腰椎の椎弓切除術に対して、骨切りワイヤーの構造を最適化したこと、および右側用と左側用のガイドパイプを備えていることを特徴としており、従来の骨形成的椎弓切除術用手術器械に比較して、操作性と安全性の点で大きな改善効果が得られた。



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## 【特許請求の範囲】

【請求項1】 頸椎および胸椎用の骨形成的椎弓切除術用手術器械と腰椎用の骨形成的椎弓切除術用手術器械からなる骨形成的椎弓切除術用手術器械。

【請求項2】 頸椎及び胸椎用の骨形成的椎弓切除術用手術器械は骨切りワイヤーとガイドスパチュラから成る請求項1に記載の骨形成的椎弓切除術用手術器械。

【請求項3】 ガイドスパチュラ先端部の片側に関節包切開用の鋸歯状部を設けたことを特徴とする請求項1または請求項2に記載の骨形成的椎弓切除術用手術器械。

【請求項4】 腰椎用の骨形成的椎弓切除術用手術器械は骨切りワイヤー、ガイドパイプおよびガイドハンドルから成る請求項1に記載の骨形成的椎弓切除術用手術器械。

【請求項5】 頸椎及び胸椎用の骨形成的椎弓切除術用手術器械の骨切りワイヤーが頭無ワイヤーであることを特徴とする請求項1～3に記載の骨形成的椎弓切除術用手術器械。

【請求項6】 腰椎用の骨形成的椎弓切除術用手術器械の骨切りワイヤーが外側アプローチ用のヘラ型ワイヤーまたは内側アプローチ用の球型ワイヤーであることを特徴とする請求項1または請求項4に記載の骨形成的椎弓切除術用手術器械。

【請求項7】 骨形成的椎弓切除術用手術器械が右側用と左側用からなることを特徴とする請求項1～6に記載の骨形成的椎弓切除術用手術器械。

【請求項8】 請求項1～7に記載の骨形成的椎弓切除術用手術器械とドリルガイドを含むことを特徴とする骨形成的椎弓切除術用手術器械一式。

【請求項9】 請求項1～7に記載の骨形成的椎弓切除術用手術器械、ドリルガイド、ドリル、骨ネジ、ワイヤーヘッド把持カンシ、ドライバーガイド、骨ネジドライバー、ユニバーサル六角ドライバー、スパナーおよび収納ケースから成る骨形成的椎弓切除術用手術器械一式。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、脊髄腫瘍や脊柱管狭窄症などの脊椎外科手術に用いられる、脊椎骨の骨形成的椎弓切除術用手術器械に係るものである。

## 【0002】

【従来の技術】整形外科手術において、Leonard Gigliが、表面を粗に加工した1本の鋼線で骨切りを行ってから、種々の改良がなされている(Gigli, Centralblatt fur Chirurgie, 18, 409-411, 1894)。これらの骨切りワイヤーは、通常の骨の切断作業を行う場合には非常に便利であるが、脊髄などの神経近傍にある骨、すなわち椎弓の切断作業の際には、硬膜や神経根を傷つける可能性が高い。

【0003】そこで、骨切りワイヤーをヴェニューラ針等に通して、骨切ワイヤーの切断面を被覆した後に、脊

椎硬膜外腔に挿入する方法などが一般的である(富田ら、臨整外, 28, 1249-1257, 1993)。しかしながら、従来の方法では、脊椎硬膜外腔に挿入する際の操作性が悪く、熟練した技術を要求されるため、安全性の面でも問題があった。

## 【0004】

【発明が解決しようとする課題】本発明は、従来の技術にくらべて、操作性および安全性の点で優れている新規な骨形成的椎弓切除術用手術器械を提供することが目的である。

## 【0005】

【課題を解決するための手段】上記課題を解決するため、本発明者らは鋭意研究を重ね、操作性と安全性に優れた新規な骨形成的椎弓切除術用手術器械を開発するに至った。

【0006】まず、椎間孔すなわち椎弓下に骨切りワイヤーを通すには、直接的に椎間孔にワイヤーを通す方法(直接アプローチ)と、椎間関節を経由して椎間孔に通す方法(経椎間関節的アプローチ)が考えられる。脊椎骨

の解剖学的特徴により前者は腰椎に適用され、後者は頸椎・胸椎に適用される。後者の経椎間関節的アプローチは従来ない新規なアプローチであり、脊髄の存在する高位、すなわち頸椎・胸椎レベルでは困難とされていた椎弓の切断を可能とするアプローチである。

【0007】頸椎部、胸椎部の椎弓の切断には、経椎間関節的アプローチで行う。ガイドスパチュラにセットされた骨切りワイヤーが、椎間関節内を通って椎間孔に達するために、安全かつ容易に椎間孔にワイヤーを通すことができる。そのために、ガイドスパチュラの先端部には、骨切りワイヤーをセットするための穴と、関節包を切開するために先端片側の側方に設けられた鋸歯状の構造を有している。その結果、ガイドスパチュラの先端の孔にワイヤーを通してセットし、脊柱管側から椎間孔に椎間関節内を経由して、安全かつ容易に骨切りワイヤーを誘導することができる。

【0008】また、頸椎部、胸椎部に用いる骨切りワイヤーの先端は、ガイドスパチュラの孔に骨切りワイヤーが挿入しやすいように、ワイヤー先端部は溶接処理して、硬くしておくことが好ましい。

【0009】腰椎部の椎弓切断は直接的アプローチで行うが、この方法には2通りの方法がある。椎間孔の外側から脊柱管内に挿入する方法(外側アプローチ)と、脊柱管内から椎間孔外側に挿入する方法(内側アプローチ)である。椎間孔に骨切りワイヤーを挿入する際に、骨切りワイヤーの切断面が露出されていないことが安全のために重要であり、この点で経椎間関節的アプローチとは異なっている。そこで、骨切りワイヤーをガイドパイプに通すことによって、切断面を被覆することが好ましい。さらに、ガイドパイプの長さは、脊椎硬膜外腔に骨切りワイヤーを挿入する際に、患部周辺の組織に骨切り

ワイヤーの切断面が接触できない程度に長いことが好みである。

【0010】腰椎部に用いる骨切りワイヤーの先端が、ガイドパイプの先端から露出されていると、椎間孔に骨切りワイヤーを挿入する際に、特に外側アプローチの場合に、硬膜などの組織を傷つける危険性が高くなる。いっぽう内側アプローチでは硬膜損傷の可能性は低いが、ワイヤー先端が軟部組織の中に埋もれてしまい、ワイヤーの先端部をワイヤーヘッド把持カンシでつまんで引き出す際に、先端部が確認し難くなる可能性が大きい。

【0011】そこで、骨切りワイヤーの先端の構造を改良することにより、椎間孔に骨切りワイヤーを挿入する際の操作性を高めると共に、安全性を高めることが好みである。本発明者らは、脊椎の頸椎・胸椎および腰椎とでは、椎間関節の形態や脊椎硬膜外腔の空間の形状や大きさが異なることに着目した結果、骨切りワイヤーの先端構造は、頸椎・胸椎手術用および腰椎手術用で、それぞれ最適化することが好みといいう結論に達した。これらの先端構造は、腰椎用では、ガイドパイプに通した骨切りワイヤーが、ガイドパイプから抜け落ちることを防止するストッパーとしても役立つ。また頸椎・胸椎用では、ガイドスパチュラの孔に骨切りワイヤーが通しやすいように、先端部を溶接処理して硬くしておくことが好みである。

【0012】また、腰椎骨切りワイヤーの後端が、ガイドパイプの後端から露出されていると、手術時に術者を傷つける恐れがある。従って、椎間孔に骨切りワイヤーを挿入する際の操作性を高めるためのガイドハンドルは、術者が保持するのに便利な構造であると共に、中心部を中空構造として、ガイドパイプの後端から露出されている骨切りワイヤーを収納できる構造であることが好みである。

#### 【0013】

【発明の実施の形態】発明の実施の形態を、実施例にもとづき図面を参照して説明する。

【0014】骨切りワイヤー用のワイヤー素材は、脊椎骨を切断できる程度の強度を有し、切断時に骨表面で滑らない程度の表面粗さを有するように、ステンレススチール製のフィラメントをより合わせた継り糸状にしてある。外径に関しては特に制限はないが、0.5mm以下が適している。

【0015】ガイドスパチュラは、頸椎・胸椎の椎間孔に骨切りワイヤーを通すために用いられる、ガイド用のスパチュラである。骨切りワイヤーのガイドとして椎間関節内を通しやすくするために、ガイドスパチュラの先端部は薄板状であって、緩やかな曲線状に曲げ加工してあることが好みである。また、ガイドスパチュラの先端部には、骨切りワイヤーを通すための穴を作製してある。使用時には、先端部の2つの穴に骨切りワイヤーを通して固定し、椎間関節内を通す際に、ワイヤーが抜け難い

ようにしてある。ガイドスパチュラ先端部の2つの穴の間には、先端部の裏面に、ガイドスパチュラの長さ方向に沿って1本の溝を作製してある。これは、セットした骨切りワイヤーの弛みをなくして、スパチュラの裏面とワイヤーが密着した状態にすることにより、狭い空間内をスムーズに通過できるようにするための工夫である。また関節包を切開するために、先端部の片側側方には鋸歯状の構造が設けてあり、鋸として利用できる。また、右側用と左側用では、先端部側方の鋸歯状構造を、それぞれ反対側に設けてある。これらの工夫の結果、ガイドスパチュラの先端の2つの孔にワイヤーを通して、脊柱管側から椎間孔へと狭い椎間関節内を経由させた時に、安全に操作性良く骨切りワイヤーを誘導することができる。ガイドスパチュラの一例を、図1に示した。

【0016】本発明の腰椎用（直接的アプローチ用）骨切りワイヤーの先端金具に関しては、外側アプローチでは、椎間孔外側の軟部組織に埋没しても、その先端が確認しやすい形状としてヘラ型であることが好みしく、さらにガイドパイプの形状に合わせて曲げ加工を施したもののが最適である。また、ガイドパイプに骨切りワイヤーを通して先端部がガイドパイプ内に引き込まれないようにするためには、先端金具の最大幅はガイドパイプの外径よりも大きいことが必要である。外径0.36mmのSUS304ステンレススチール製ケーブルの先端に、ヘラ型の先端金具をカシメ加工した一例を図2に示した。

【0017】腰椎用（直接的アプローチ用）のうちで、内側アプローチに用いる骨切りワイヤーの先端金具に関しては、腰椎の脊椎硬膜外腔の形状を考慮して、球状構造が最適である。また、ガイドパイプに骨切りワイヤーを通して先端部がガイドパイプ内に引き込まれないようにするためには、先端金具の最大径はガイドパイプの外径よりも大きいことが必要である。ただし、あまり大きすぎると、腰椎の脊椎硬膜外腔への挿入時に、周辺の組織を圧迫する恐れがあるため、球型先端金具の最大径は自ずと制限される。外径0.36mmのSUS304ステンレススチール製ケーブルの先端に、球型の先端金具をカシメ加工した一例を図3に示した。

【0018】ガイドパイプは、腰椎椎間孔に骨切りワイヤーを挿入する際に、骨切りワイヤーの切断表面を被覆することにより、周辺組織の損傷を防止することが第一の目的である。従って、挿入時に周辺組織に接触する部分の長さよりも、ガイドパイプの長さは長いことが必要である。また、ガイドパイプは、骨切りワイヤーをガイドパイプに通す時、および、椎間孔挿入後にガイドパイプを抜き取る時に、骨切りワイヤーをスムーズに抜き差しできる程度の内径を確保できるものでなければならぬ。また、椎間孔の形状に適合させるためには、ガイドパイプの先端領域は直線状ではなく、椎間孔の形状に適合しやすい形状、例えば円弧状であることが好みである。

また、ガイドパイプの外径は、腰椎椎間孔をスムーズに通せる程度に小さいことが必要である。さらに、組織との接触時に与える損傷を防ぐためには、ガイドパイプの外表面は、鏡面仕上げなどにより滑らかな状態にしておくことが望ましい。

【0019】また、手術部位により、骨切りワイヤーの挿入を右側椎間孔に行う場合と、左側椎間孔に行う場合の2つのケースがある。このような状況に対応するためには、ガイドパイプの先端の円弧状部分と直線状部分が同一平面ではなく、適切なる角度を有している必要がある。このようなガイドパイプを作製する場合は、ガイドパイプの先端の円弧状部分を加工した後に、直線状部分を円弧状部分の右側に曲げるか、左側に曲げるかによって作製することができる。このときの曲げ角度は特に制限はなく、用途に応じて最適の角度とするのが良い。

【0020】SUS304製で、外径2.0mm、内径1.0mmのパイプ（外表面は鏡面仕上げ）を用いた、左側用のガイドパイプの一例を図4に示した。なお、この例では、先端の円弧状部分と直線状部分の角度は45°にしてある。安全性を考慮して、ガイドパイプの先端3ミリ程度をプレス加工し、先端部の角丸めを施してある。

【0021】ガイドハンドル（図5）のハンドル部4は、術者が把持するのに適当な太さと長さであれば、特に制限はない。ガイドハンドルの中心部には、骨切りワイヤーを挿入するため、長さ方向に中空構造が設けられている（図5に破線で示してある）。この中空部の径は、骨切りワイヤーをスムーズに挿入できる程度の太さであれば、特に制限されない。先端部には、ガイドパイプを固定するための、先端ホルダー6および先端金具3が設けられている。後端部には、ロックブロック7とクランプ金具5があり、骨切りワイヤーのロックに用いる。ピン8およびピン9は、ロックブロック7を移動させて、中空部に通された骨切ワイヤーを固定する際に用いられる。

【0022】骨形成的椎弓切除術用手術器械は、頸椎・胸椎用としては骨切ワイヤーとガイドスパチュラ、腰椎用としては骨切ワイヤー、ガイドパイプおよびガイドハンドルから構成される。また、頸椎部・胸椎部の手術時には、ガイドスパチュラの2つの孔に、頭無ワイヤーを通して、いっぽう腰椎部の手術時には、ガイドパイプの先端部から骨切ワイヤーの後端部を挿入し、ガイドパイプの後端部から骨切ワイヤーを引き出して、骨切ワイヤーの先端金具をガイドパイプの先端部に正しくセットする。特に、先端ヘラ型の骨切ワイヤーをセットした場合は、先端金具の向きが正しいことを確認することが必要である。次に、ガイドハンドルの先端の開口部から、中空部に骨切ワイヤーの後端部を挿入し、ガイドハンドルの後端部より骨切ワイヤーを引き出す。ガイドハンドルの先端開口部にガイドハンドルの後端部を挿入して固定

した後、骨切りワイヤーを引っ張ってたるみのないことを確認後、ロックブロック（図5の7）を後方に引くと、骨切りワイヤーが固定されて使用可能な状態になる。

【0023】頸椎部・胸椎部の骨形成的椎弓切除手術の場合は、ガイドスパチュラに頭無ワイヤーをセットした骨形成的椎弓切除術用手術器械を用いる。腰椎部の骨形成的椎弓切除手術の場合は、先端が球型あるいはヘラ型のワイヤーを、用途に応じてセットした骨形成的椎弓切除術用手術器械を用いる。

【0024】また、切断する椎弓の左右により、右側椎弓の場合は右側用の骨形成的椎弓切除術用手術器械を、左側椎弓の場合は左側用の骨形成的椎弓切除術用手術器械を用いる。

【0025】これらの骨形成的椎弓切除術用手術器械に加えて、骨ネジ、ドリルガイド、ドリル、ワイヤーヘッド把持カンシ、ドライバーガイド、骨ネジドライバーなどの骨形成的椎弓切除手術に必要な器具類一式を、収納ケース内に揃えておくと、効率的な手術が可能である。

20 収納ケースは、高圧蒸気滅菌に耐え得る素材であれば特に制限はないが、軽量化の観点からは、アルミ製の収納ケースが最適である。収納ケース内に設置する、それぞれの器具の位置を固定するための部材も、高圧蒸気滅菌に耐え得る素材であれば特に制限はないが、シリコンゴム製が最適である。

【0026】ドリルガイドは、非常に薄い椎弓の中をドリルが正確に穿孔できるように、ドリルガイド先端は穿孔到達点を正確に指示出来るようになっており、また穿孔点が安定するように、ドリル刺入孔は鋸歯状の形状で椎弓にしっかりと固定されるようになっている（図6）。

【0027】本発明の骨形成的椎弓切除術用手術器械および骨形成的椎弓切除術用手術器械一式は、脊椎外科手術において、脊髄腫瘍や脊柱管狭窄症などの、脊柱管内操作を必要とする手術の場合に有用である。

【0028】本発明の骨形成的椎弓切除術用手術器械を用いて、腰椎部では、患者の椎間孔にガイドパイプの円弧部を挿入し、骨切りワイヤーの先端金具を反対側に露出させる。ガイドハンドル後端のロックブロックを解除し、先端金具を適当な位置まで引っ張り出した後、挿入したガイドパイプの円弧部を脊椎硬膜外腔の外まで抜き出し、最終的には骨切りワイヤーだけを椎間孔に残す。

【0029】頸椎部・胸椎部では、患者の椎間孔に、頭無ワイヤーを通してガイドスパチュラを脊柱管内から椎間関節内側の関節包を切離するように挿入し、椎間関節腔を経由して椎間関節外側の関節包を切離して、椎間孔の外側にガイドスパチュラを出した後ガイドスパチュラを抜き出し、最終的には骨切りワイヤーだけを椎間孔に残す。

50 【0030】挿入した骨切りワイヤーの両側の適当な部

位を左右の手で持ち、骨の切断部位に合わせた後、骨切りワイヤーを左右交互に引っ張って切断する。この方法により、硬膜や神経根を傷つけることなく、脊椎の椎弓の必要な部分を切断して、脊柱管内の患部を展開して手術を行うことが可能になる。

【0031】骨形成的椎弓切除術用手術器械一式に含まれる、骨ネジ、ドリルガイド、ドリル、ワイヤーヘッド把持カンシ、ドライバーガイド、骨ネジドライバーは、切断後の骨片を元の位置に戻して固定する際に用いる。ドリルガイドは、薄い椎弓の骨片内を正確にドリリングできるように、ドリリングの刺入部と出口部を的確に把持するように、出口部はフック状にして出口部の孔に引っ掛かるようになっており、刺入部は鋸歯状になっており骨をしっかりと保持できるようになっている。このドリルガイドを用いて、切断した骨片を元の位置に固定するための骨ネジを通して、ネジ穴をあける。骨ネジは市販品が利用できるが、例えばナカシマプロペラ(株)の皮質骨スクリュー(医療用具承認番号: 20100BZ201423000)は、チタン製のネジの先端部にタップが切ってあるため、あらかじめタップを切る作業をすることなく、骨ネジドライバーで骨片を固定化できるという利点がある。

#### 【0032】

【実施例】以下に、本発明の骨形成的椎弓切除術用手術器械の有用性を示すために、本発明の骨形成的椎弓切除術用手術器械を用いた手術例を実施例として示すが、本発明はこれらの実施例のみに限定されるものではない。

#### 【0033】

【実施例1】頸椎部の脊髓腫瘍の患者の椎弓切断には、経椎間関節的アプローチを用いた。右側用ガイドスパチュラの先端部の2つの穴に、頭無ワイヤーを通してセットした後、患者の頸椎の脊柱管側からガイドスパチュラを挿入した。脊柱管内から椎間関節内側の関節包を切離すように挿入し、椎間関節腔を経由して椎間関節外側の関節包を切離して椎間孔の外側にガイドスパチュラを出した後、ガイドスパチュラを抜き出した。最終的には骨切りワイヤーだけを椎間孔に残し、右側椎弓をワイヤーで切断した。この方法により、周囲の組織を損傷することなく、安全に椎弓の切断を行うことができた。同様に、左側用ガイドスパチュラを用いて左側椎弓を切断することにより椎弓切除を行うことができ、脊柱管内の硬膜を充分に展開でき、腫瘍の手術を行うことが可能になった。

#### 【0034】

【実施例2】腰椎の内側アプローチの場合は、ヘラ型ワイヤーをガイドパイプおよびガイドハンドルにセットした後、脊柱管内から椎間孔の外側へガイドパイプの先端部を挿入した。ワイヤーのヘラ型部をワイヤーヘッド把持カンシでつまんで、適当な長さにワイヤーを引き出し

た。次に、ガイドパイプおよびガイドハンドルを外してワイヤーだけの状態にしてから、目的の椎弓をワイヤーで切断した。

#### 【0035】

【実施例3】腰椎の外側アプローチの場合は、球型ワイヤーをガイドパイプおよびガイドハンドルにセットした後、椎間孔の外側から脊柱管内へガイドパイプの先端部を挿入した。ワイヤーの球型部をワイヤーヘッド把持カンシでつまんで、適当な長さにワイヤーを引き出した。

10 次に、ガイドパイプおよびガイドハンドルを外してワイヤーだけの状態にしてから、目的の椎弓をワイヤーで切断した。

#### 【0036】

【発明の効果】本発明の骨形成的椎弓切除術用手術器械は、頸椎部、胸椎部では従来出来なかった骨形成的椎弓切除術を可能にしたこと、腰椎部での骨形成的椎弓切除術用骨切りワイヤーの構造を、外側アプローチと内側アプローチでそれぞれ最適化したこと、および右側用と左側用のガイドパイプを備えていることを特徴としており、従来の骨形成的椎弓切除術用手術器械に比較して、操作性と安全性の点で大きな改善効果が得られる。また本術式を行うことにより、高価であり強大な脊椎インスツルメントを体内に入れる必要がなく、治療面でも医療費軽減の面でも大きな効果が得られる。

#### 【図面の簡単な説明】

【図1】ガイドスパチュラの構造を示す図であり、右側は正面図、左側は側面図の2面図である。

【図2】ヘラ型ワイヤーの先端部の部分構造を示す図であり、上側は正面図、下側は側面図の2面図である。

30 【図3】球型ワイヤーの先端部の部分構造を示す図であり、上側は正面図、下側は側面図の2面図である。

【図4】左側用ガイドパイプの構造を示す図であり、上側は側面図、下側は正面図の2面図である。

【図5】ガイドハンドルの構造を示す図である。

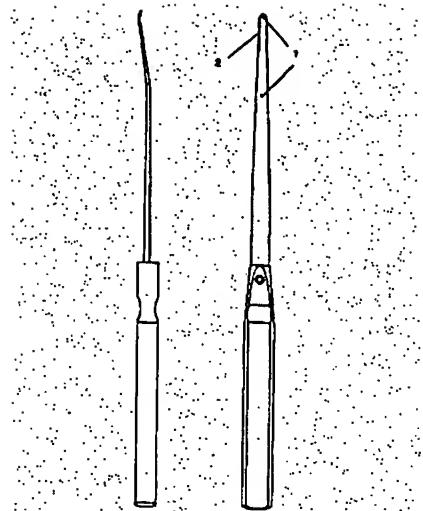
【図6】ドリルガイドの構造を示す図であり、右側は正面図、左側は側面図の2面図である。

【図7】骨形成的椎弓切除術用手術器械一式を示す図である。

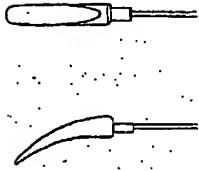
#### 【符号の説明】

- 40 1…頭無ワイヤーを通すための穴
- 2…関節包切開用の鋸歯状部
- 3…先端金具
- 4…ハンドル
- 5…クランプ金具
- 6…先端ホルダー
- 7…ロックブロック
- 8…ピン1
- 9…ピン2

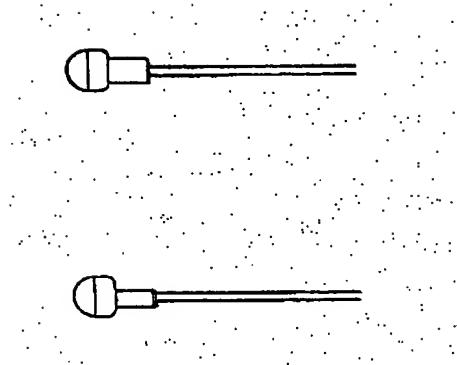
【図1】



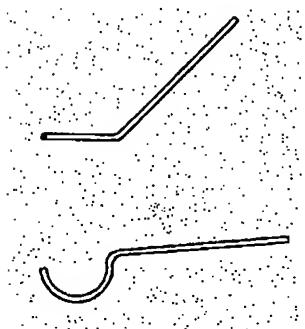
【図2】



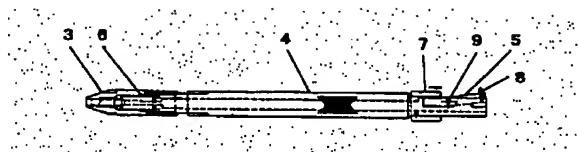
【図3】



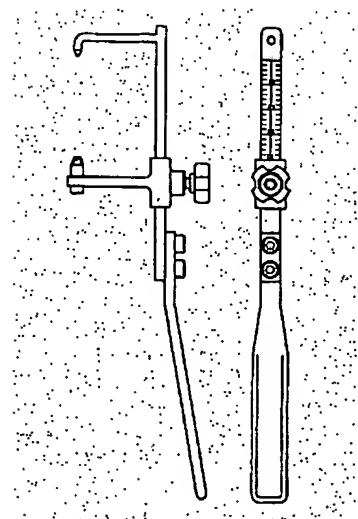
【図4】



【図5】



【図6】



【図7】

